

WHAT IS CLAIMED IS:

1. A system for conditioning scale on the surface of a metal object comprising:
  - at least one nozzle adapted to spray droplets of an aqueous caustic solution;
  - at least one reservoir for containing said aqueous caustic solution communicating with said at least one nozzle;
  - a driving mechanism positioned to move the metal object relative to said at least one nozzle;
  - a temperature-sensing device positioned to sense the temperature of the surface of said metal object prior to the metal object passing said at least one nozzle,
  - a cooling mechanism adjacent said temperature-sensing device, and
  - a control mechanism to control said cooling mechanism responsive to the sensed temperature of the surface of said metal object.
- 2 The system as defined in claim 1 wherein there is at least a second reservoir for a fluid communicating with said at least one nozzle and with said control mechanism.
- 3 The system as defined in claim 1 wherein there is at least a second nozzle adapted to spray droplets of a solution communicating with said reservoir, and with said control mechanism.
- 4 The system as defined in claim 1 wherein the control mechanism includes flow control devices to control the flow individually from each reservoir to said nozzle
- 5 The system as defined in claim 1 wherein said metal object is a metal strip.
6. The system as defined in claim 5 wherein there is at least one nozzle disposed on each side of said strip.

- 7 The system as defined in claim 1 wherein an acid pickling station is provided.
8. The system as defined in claim 1 wherein the control is configured to control the cooling device to cool the surface of the metal object to a temperature above the melting point of the composition contained in the aqueous solution and below the temperature at which the Leidenfrost effect appears.
- 9 The system as defined in claim 5 further characterized by a surface coverage analyzer adjacent said at least one nozzle.
- 10 The system as defined in claim 1 wherein there is a speed sensing device to sense the speed of said metal object, and said control device is configured to vary the flow of said aqueous caustic solution responsive to the sensed speed of the metal object.
11. A method of treating scale on the surface of a metal object comprising the steps of:
- a) providing a metal object with scale thereon;
  - b) providing an aqueous solution comprised of an alkali metal hydroxide or mixture of alkali metal hydroxides;
  - c) controlling the temperature of the surface of the metal object to a temperature above the melting point of the alkali metal hydroxide or hydroxides in anhydrous form and where conditioning occurs, and below the temperature at which the Leidenfrost effect appears; and
  - d) spraying said solution on the surface of the metal object.
12. The method as defined in claim 11 wherein the solution contains sodium hydroxide or potassium hydroxide or a mixture thereof.

- 13 The method as defined in claim 11 wherein the metal is acid pickled after spraying with said solution.
- 14 The method of claim 11 wherein the concentration of the solution is between about 15% and 65% solids by weight.
- 15 The method as defined in claim 11 wherein the solution concentration is between about 35% and 45% solids by weight.
- 16 The method as defined in claim 11 wherein the concentration of the solution is about 40% solids by weight.
- 17 The method as defined in claim 11 wherein the temperature of the surface of the metal object is at least about 450°F, and does not exceed about 700°F.
18. The method as defined in claim 14 wherein the temperature of the surface of the metal object is at least about 450°F and does not exceed about 600°F
19. The method as defined in claim 11 wherein the metal is stainless steel strip.
20. The method of claim 11 wherein the solution contains an effective amount of an additive selected from the group of alkali metal carbonates, alkali metal chlorates, alkali metal nitrates, alkali metal permanganates, and mixtures thereof.
21. The method of claim 20 wherein the additive is an alkali metal permanganate.
22. The method of claim 12 wherein aqueous solution is comprised of a eutectic mixture of sodium hydroxide and potassium hydroxide
- 23 An aqueous solution comprised of a mixture of sodium hydroxide and potassium hydroxide, wherein there is between about 15% and about 65% solids by weight.

- 24 The solution as defined in claim 23 wherein there is between 35% and 45% by weight solids.
- 25 The solution as defined in claim 23 wherein there is about 40% by weight solids.
- 26 The solution as defined in claim 23 wherein the mixture of sodium hydroxide and potassium hydroxide is a eutectic mixture.
- 27 The solution as defined in claim 23 further characterized by an effective amount, up to about 1% by weight of solids of an alkali metal permanganate
- 28 The solution as defined in claim 27 wherein the alkali metal permanganate is potassium permanganate.